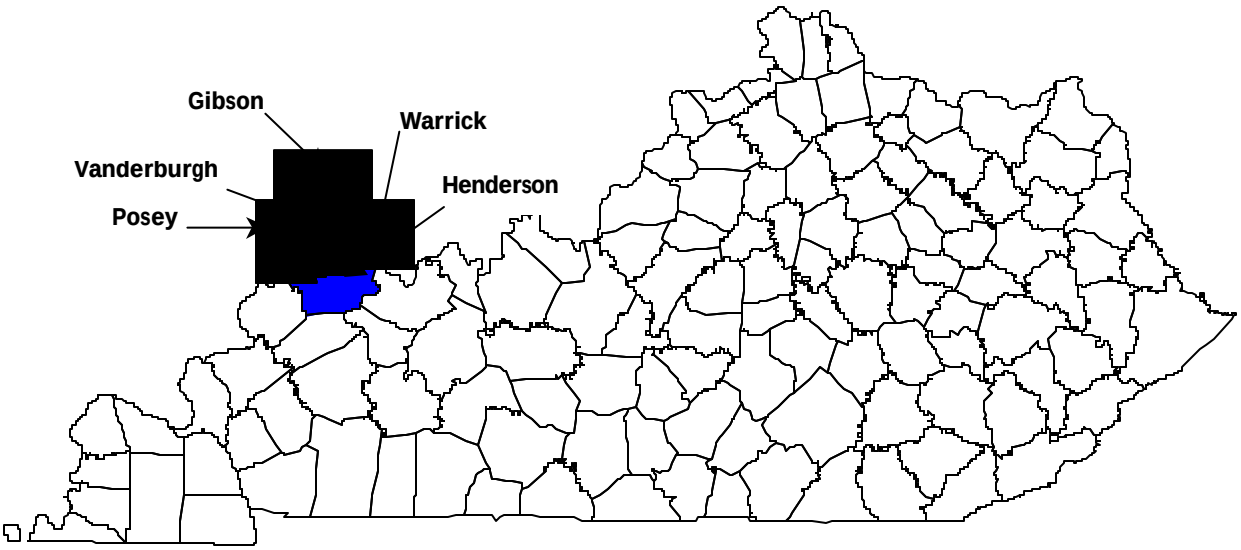
Kentucky Portion of the Evansville-Henderson, IN-KY MSA



The Evansville-Henderson, Indiana-Kentucky MSA, (Metropolitan Statistical Area) encompasses two states and four counties. It includes Henderson County in Kentucky and Posey, Vanderburgh, and Warrick Counties in Indiana. Gibson County, Indiana, which is not in the Evansville-Henderson MSA, was also included in this document for study purposes. In 2001, this MSA was listed as the 133rd largest MSA within the United States.

HENDERSON COUNTY, KENTUCKY

Henderson County is part of the Evansville-Henderson, Indiana-Kentucky Metropolitan Statistical Area (MSA) and is located to the west of Daviess County, Kentucky, to the northwest of McLean County, Kentucky, to the north of Webster County, Kentucky, and to the northeast of Union County, Kentucky. Additionally it is located to the southeast of Posey County, Indiana, to the south of Vanderburgh County, Indiana, and to the southwest of Warrick County, Indiana, and to the far south of Gibson County, Indiana.

Geography/Topography

Henderson County has a land area of 440 square miles and is located in northwestern Kentucky where the banks of the Ohio River form the northern boundary of the county. It is part of the Western Kentucky Coal Field Region.

Meteorological Information

Due to the close proximity of Evansville, Indiana, meteorological data from Evansville was used for this Kentucky area. Wind speed/wind direction information shows that the majority of the time for the period 1988–1992, the wind in the Henderson County area came from the southwest and typically from 7-10 knots. (See figure 1-A) The mean high temperature for July for the area from 1961 through 1990 was 89?F, the mean low was 68?F. The mean precipitation for the same period was 3.8 inches.

Planning

The authority for air quality planning in the Henderson County area resides with the Kentucky Environmental and Public Protection Cabinet. Transportation planning for all of Henderson County is performed by the Evansville Urban Transportation Study (EUTS), which is the Metropolitan Planning Organization and the Kentucky Transportation Cabinet.

Air Monitoring

For the 2001 – 2003 monitoring period, the $PM_{2.5}$ monitor (21-101-0006) in Henderson County, Kentucky, shows an average annual design value of 14.1 micrograms per cubic meter, which would be classified as a county in attainment of the $PM_{2.5}$ annual National Ambient Air Quality Standard (NAAQS). However, because there are three $PM_{2.5}$ monitors in Vanderburgh County, Indiana, each with a probable exceedence of the annual $PM_{2.5}$ standard, Henderson County information is being presented in this document. The monitoring information for 2003 is complete for Henderson County, Kentucky. However, the 2003 monitoring data reported for the Vanderburgh County, Indiana, is the latest available and is not be complete through December 2003. (See table 1-A)

Population

Based on projections to 2002 from the 2000 census data, there are 44,995 persons living in Henderson County. (See table 1-C) That represents approximately 102 persons per square mile. The population of Henderson County is approximately 40.8% rural with the remaining 59.2% living in incorporated areas. The largest city in Henderson County is Henderson.

Henderson County's population from 1990 through 2000 increased by approximately 4.1% (43,044 to 44,829). The population is further expected to increase by an additional 3.3% between 2000 and 2010. (See table 1-B)

Based on 2002 population data for the Evansville-Henderson study area, Henderson County represents approximately 13.6% of the total 2002 population in the MSA area and 100% of the Kentucky portion of the MSA area. (See table 1-C)

Air Emissions

The emissions presented in this document are from the U.S. EPA's 1999 National Emission Inventory (NEI). In addition, the $PM_{2.5}$ emissions provided in this document are for primary $PM_{2.5}$ from the 1999 NEI. Primary $PM_{2.5}$, is directly emitted from a stack or an open source and includes filterable and condensible particles.

Point Sources

Point source VOC emissions from Henderson County were estimated at 603 tons per year in 1999, which represents approximately 10% of the total 5,826 tpy overall VOC point source emissions from the Evansville-Henderson study area. Point source NO_x emissions from Henderson County were estimated at 482 tpy in 1999, which represents approximately 1% of the total 88,763 tpy overall NO_x point source emissions from the Evansville-Henderson study area. (See table 1-D)

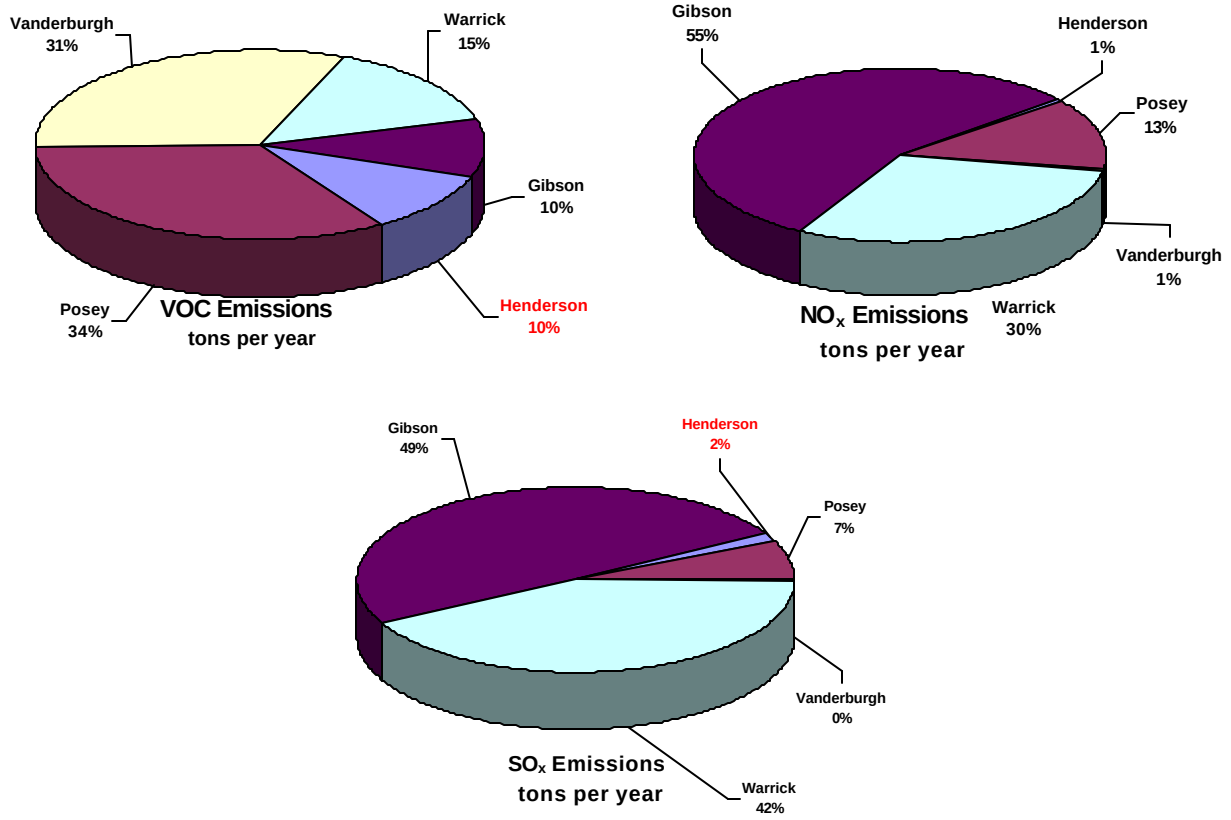
Point source SO_x emissions from Henderson County were estimated at 4,887 tons per year in 1999, which represents approximately 2% of the total 321,009 tpy overall SO_x point source emissions from the Evansville-Henderson study area. (See table 1-E)

Point source NH_3 emissions from Henderson County were estimated at 0 tpy in 1999, which represents 0% of the total 70 tpy overall NH_3 point source emissions from the Evansville-Henderson study area. (See table 1-F)

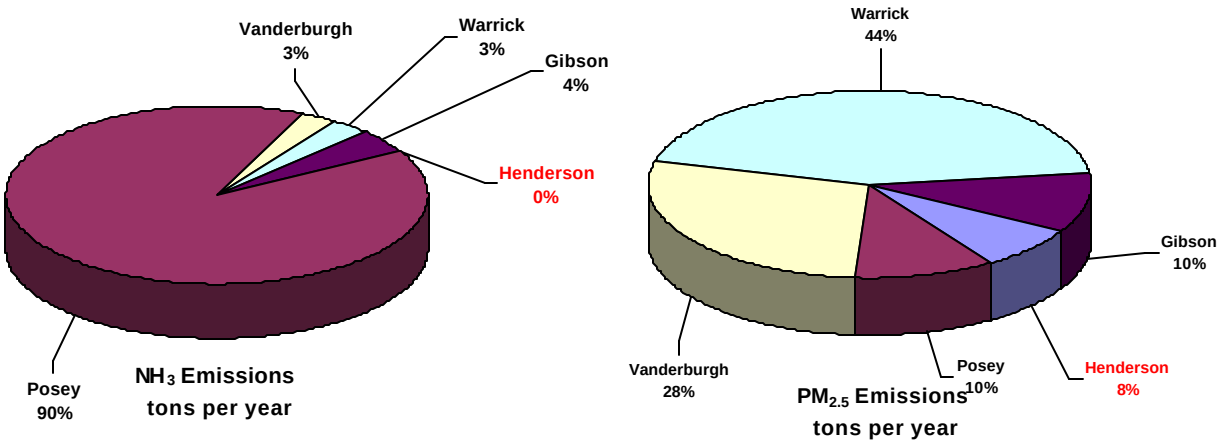
Point source $PM_{2.5}$ emissions from Henderson County were estimated at 416 tons per year in 1999, which represents approximately 8% of the total 5,460 tpy overall $PM_{2.5}$ point source emissions from the Evansville-Henderson study area. (See table 1-G)
Point sources located within Henderson County are subject to PSD requirements, CTG RACT requirements, Maximum Achievable Control Technology (MACT) requirements

for sources of Hazardous Air Pollutants, and New Source Performance Standards (NSPS).

1999 NEI Evansville-Henderson Study Area
Point Source Emissions
(tons per year)



1999 NEI Evansville-Henderson Study Area
Point Source Emissions
(*continued*)



Onroad Mobile Emissions

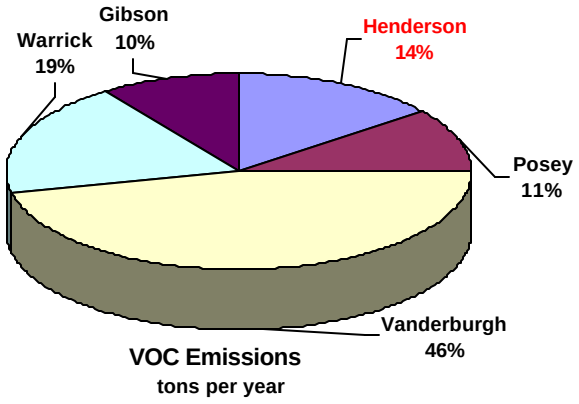
Onroad mobile source VOC emissions from Henderson County were estimated at 1,293 tons per year in 1999, which represents approximately 14% of the total 8,970 tpy of overall VOC onroad mobile source emissions from the Evansville-Henderson study area. Onroad mobile source NO_x emissions from Henderson County were estimated at 1,771 tpy in 1999, which represents approximately 13% of the total 13,650 tpy of overall NO_x onroad mobile source emissions from the Evansville-Henderson study area. (See table 1-D)

Onroad mobile source SO_x emissions from Henderson County were estimated at 68 tons per year (tpy) in 1999, which represents approximately 14% of the total 497 tpy overall SO_x onroad mobile source emissions from the Evansville-Henderson study area. (See table 1-E)

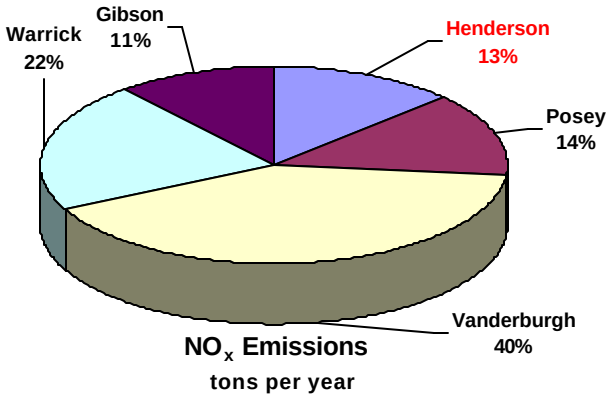
Onroad mobile source NH_3 emissions from Henderson County were estimated at 56 tpy in 1999, which represents approximately 14% of the total 396 tpy overall NH_3 onroad mobile source emissions from the Evansville-Henderson study area. (See table 1-F)

Onroad mobile source $PM_{2.5}$ emissions from Henderson County were estimated at 39 tons per year (tpy) in 1999, which represents approximately 13% of the total 301 tpy overall $PM_{2.5}$ onroad mobile source emissions from the Evansville-Henderson study area. (See table 1-G)

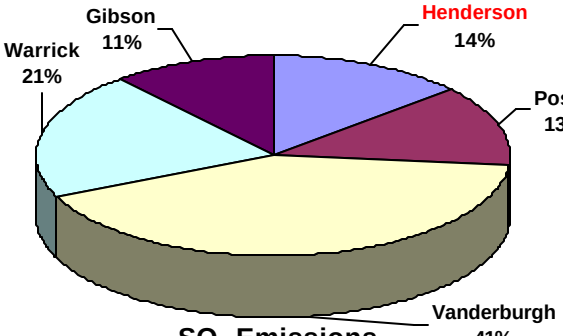
1999 NEI Evansville-Henderson County Study Area
Onroad Mobile Source Emissions
(tons per year)



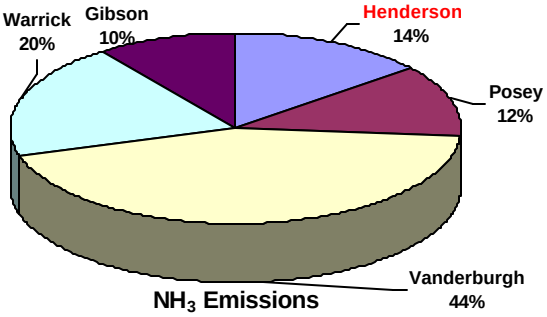
VOC Emissions
tons per year



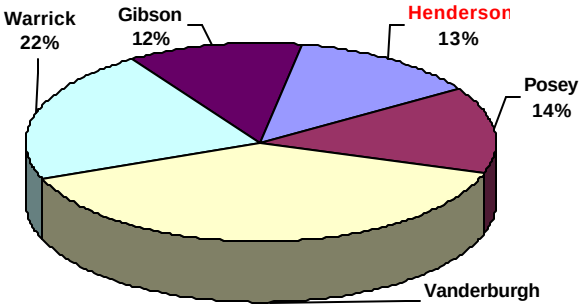
NO_x Emissions
tons per year



SO_x Emissions
tons per year



NH_3 Emissions
tons per year



$PM_{2.5}$ Emissions
tons per year

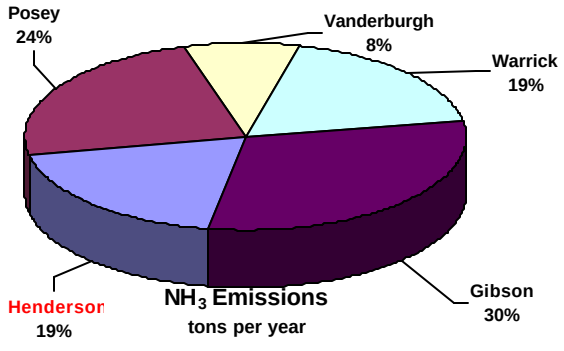
Based on information obtained from the Kentucky Transportation Cabinet, commuting traffic from other counties into Henderson County is 28.6% and classified as minimal, and the commuting traffic from Henderson County into other counties is minimal at 26.3%.

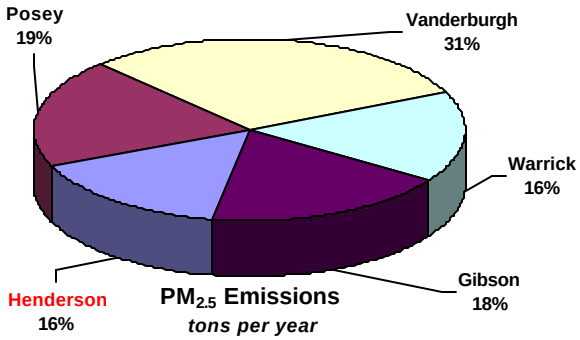
Commuting Classifications	
Not Significant	0-10%
Minimal	11-30%
High	31-50%
Significant	51% or more

Area source NH_3 emissions from Henderson County were estimated at 665 tpy in 1999, which represents approximately 19% of the total 3,530 tpy of overall NH_3 area source emissions from the Evansville-Henderson study area. (See table 1-F)

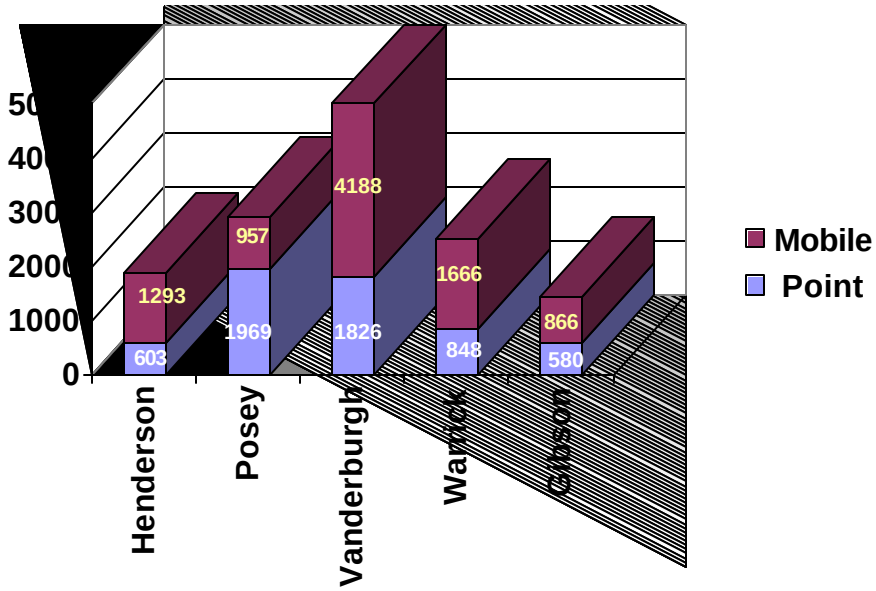
Area source $PM_{2.5}$ emissions from Henderson County were estimated at 1,120 tpy in 1999, which represents approximately 16% of the total 7,153 tpy of overall $PM_{2.5}$ area source emissions from the Evansville-Henderson study area. (See table 1-G)

1999 NEI Evansville-Henderson County Study Area
Area Source Emissions
(tons per year)

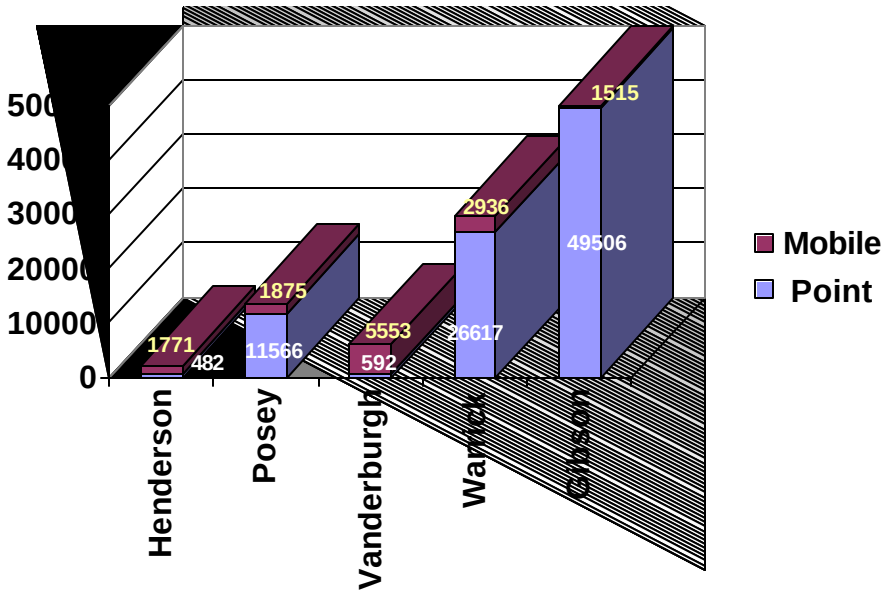




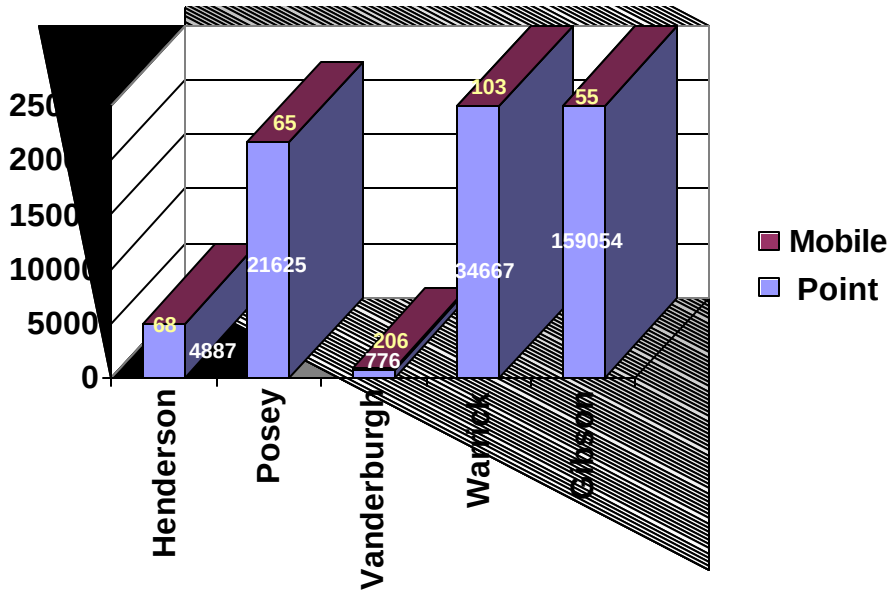
1999 NEI VOC Contribution
(tons per year)



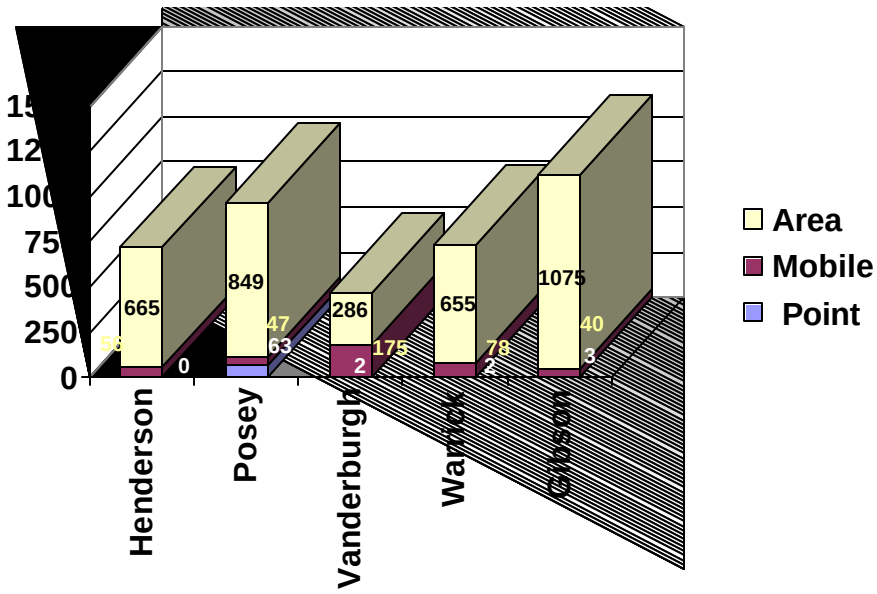
1999 NEI NO_x Contribution
(tons per year)



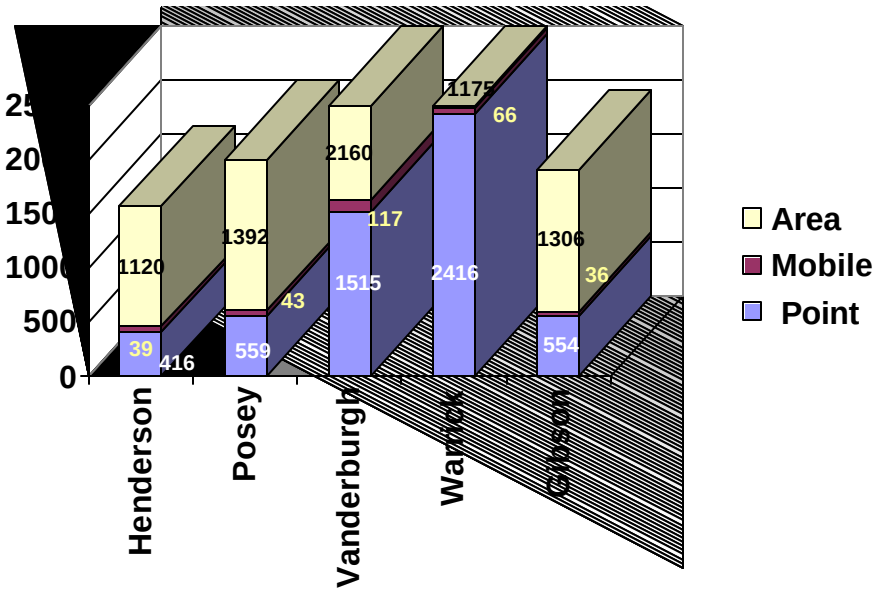
1999 NEI SO_x Contribution
(tons per year)



1999 NEI NH_3 Contribution
(tons per year)



1999 NEI $PM_{2.5}$ Contribution
(tons per year)



Conclusion and Recommendation

Henderson County, based on 2001 – 2003 $PM_{2.5}$ monitoring data, is meeting the annual $PM_{2.5}$ standard with an annual average of 14.1 micrograms per cubic meter. The monitoring and emissions data and other documentation presented indicate that Henderson County, Kentucky, does not contribute a significant amount of $PM_{2.5}$ or those emissions that contribute to $PM_{2.5}$ formation in the Evansville-Henderson area**.** Predominant wind patterns would typically have Henderson County emissions moving away from violating monitors in Indiana.

Henderson County contributes approximately 13% of total VOC emissions, 2% of the total NO_x emissions, 2% of the total SO_x emissions, 12% of the total $PM_{2.5}$ emissions, and 18% of the total NH_3 emissions in the study area.

Therefore, Henderson County should be designated attainment for the $PM_{2.5}$ standard.

Henderson County, Kentucky
Figure 1-A
Wind Rose Patterns

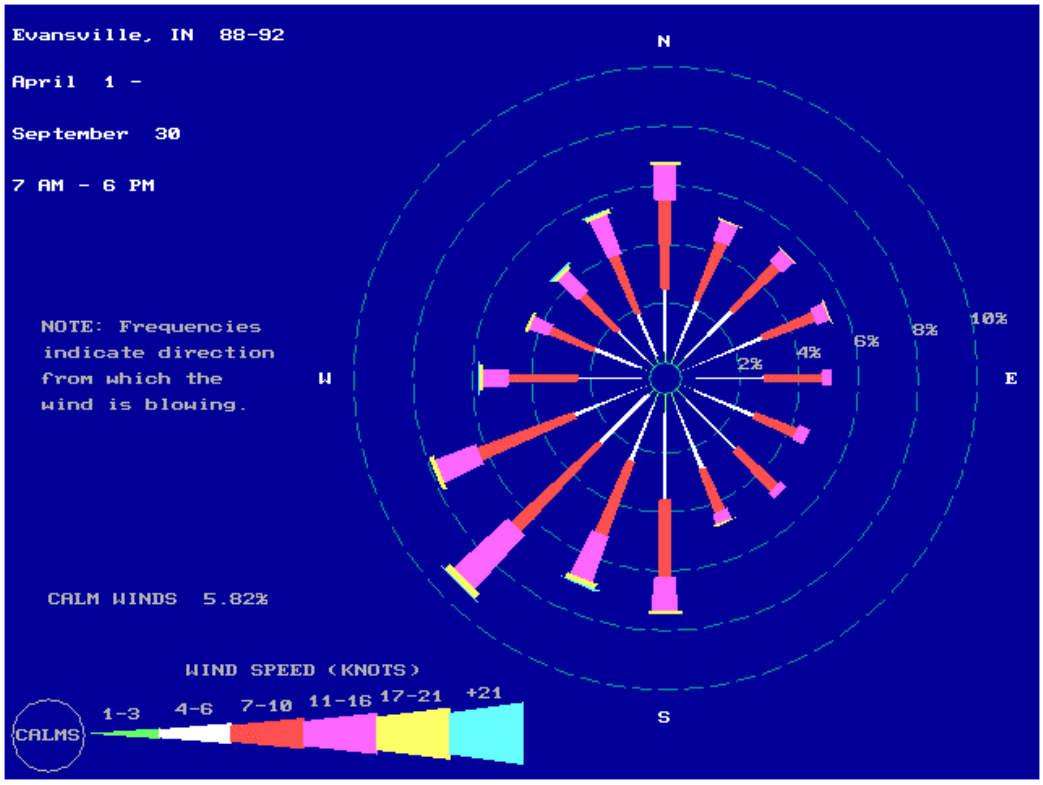


Figure 1-B
1999 NEI Evansville-Henderson MSA
VOC and NO_x Emissions
(tons per year)

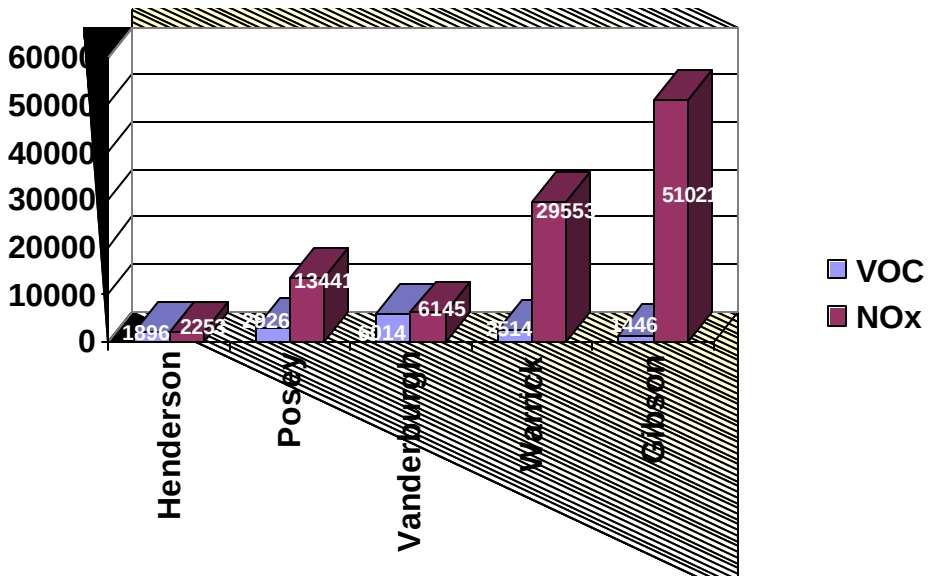


Figure 1-C
1999 NEI Evansville-Henderson MSA
SO_x Emissions
(tons per year)

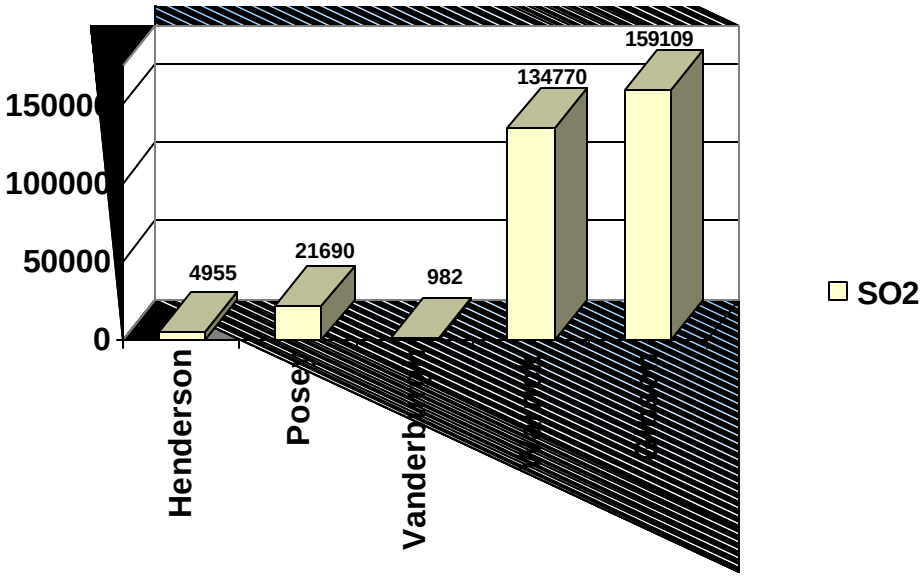


Figure 1-D
1999 Evansville-Henderson MSA
NH_3 and $PM_{2.5}$ Emissions
(tons per year)

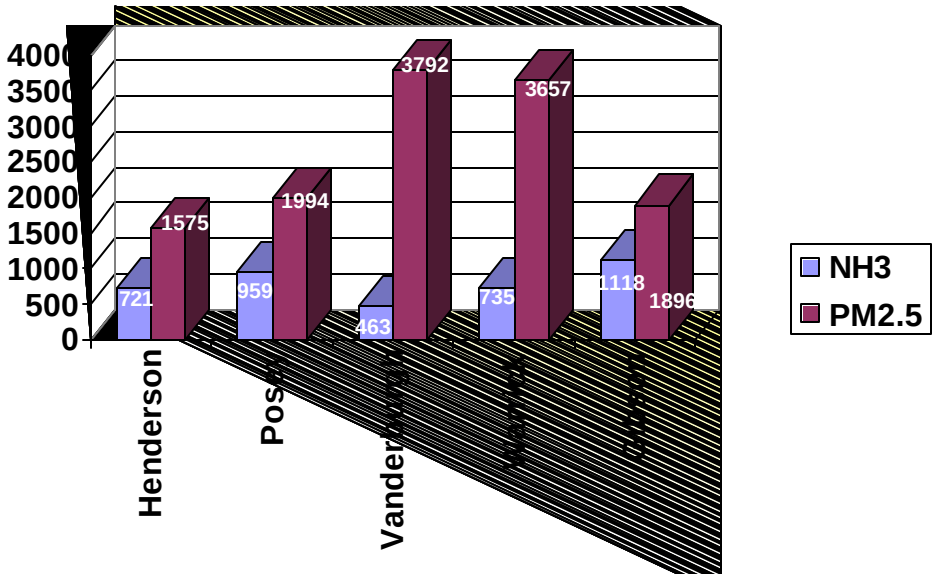


Table 1-A
Average Annual Design Values for $PM_{2.5}$
(micrograms per cubic meter)

County	2001	2002	2003*	Design Value
Kentucky				
Henderson	14.2	14.2	13.8	14.1
Webster				N/A
Indiana				
Gibson				N/A
Posey				N/A
Vanderburgh	16.2	15.2	16.6	16.0
Warrick				N/A

*The monitoring information for 2003 is complete for Henderson County, Kentucky. However, the 2003 monitoring data reported for the Vanderburgh County, Indiana, is the latest available and may not be complete through December 2003.

Table 1-B
Evansville-Henderson MSA Population Growth Data

County	1990	2000	%Growth 1990 - 2000	2010	%Growth 2000 - 2010
Kentucky					
Henderson	43,044	44,829	4.1%	46,303	3.3%
Indiana					
Gibson	31,913	32,500	1.8%	32,904	1.2%
Posey	25,968	27,061	4.2%	26,605	-1.7%
Warrick	44,920	52,383	16.6%	56,631	8.1%
Vanderburgh	165,058	171,922	4.2%	174,355	1.4%

Table 1-C
2002 Estimated Evansville-Henderson MSA Population

Kentucky	Estimated Population
Henderson County	44,995
Indiana	**Estimated Population**
Gibson County	32,590
Posey County	26,990
Vanderburgh County	171,744
Warrick County	53,624
Total Estimated MSA Population	329,943

Table 1-D
1999 NEI Evansville-Henderson MSA
VOC and NO_x Emissions
(tons per year)

County	*VOC*			*NO_x*		
	Point	Mobile	Total	Point	Mobile	Total
Gibson	580	866	1,446	49,506	1,515	51,021
Posey	1,969	957	2,926	11,566	1,875	13,441
Vanderburgh	1,826	4,188	6,014	592	5,553	6,145
Warrick	848	1,666	2,514	26,617	2,936	29,553
Henderson	603	1,293	1,896	482	1,771	2,253
Total Emissions	5,826	8,970	14,796	88,763	13,650	102,413

Table 1-E
1999 NEI Evansville-Henderson MSA
SO_x Emissions
(tons per year)

County	*SO_x*		
	Point	Mobile	Total
Gibson	159,054	55	159,109
Posey	21,625	65	21,690
Vanderburgh	776	206	982
Warrick	134,667	103	134,770
Henderson	4,887	68	4,955
Total Emissions	321,009	497	321,506

Table 1-F
1999 NEI Evansville-Henderson MSA
NH_3 Emissions
(tons per year)

County	NH_3			
	Area	Point	Mobile	Total
Gibson	1,075	3	40	1,118
Posey	849	63	47	959
Vanderburgh	286	2	175	463
Warrick	655	2	78	735
Henderson	665	0	56	721
Total Emissions	3,530	70	396	3,996

Table 1-G
1999 NEI Evansville-Henderson MSA
$PM_{2.5}$ Emissions
(tons per year)

County	$PM_{2.5}$			
	Area	Point	Mobile	Total
Gibson	1,306	554	36	1,896
Posey	1,392	559	43	1,994
Vanderburgh	2,160	1,515	117	3,792
Warrick	1,175	2,416	66	3,657
Henderson	1,120	416	39	1,575
Total Emissions	7,153	5,460	301	12,914